

# Simulated Deep Space Station Control Console Study

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*This article describes a study of deep space station operations with the aid of a simulated control console. This is currently being used to evaluate operations at the Echo Deep Space Station. This study is intended to improve performance and reduce operating costs by allowing the station to be operated on a system basis by system engineering personnel. Study approach and current status are presented.*

## I. Introduction

A study of deep space station control room operations is currently being conducted at DSS 12. The purpose of this study is to improve operational performance of the DSS. Investigations are concentrated in three areas:

- (1) Centralization of subsystem controls to optimize the operational efficiency and number of operators required
- (2) Improvement of the man-machine interface
- (3) Provision of a more rewarding position for operational personnel, thereby reducing attrition and overall operating costs.

The eventual result of this study is intended to be a specification for an improved station monitor and control console. This specification will define the functions required at the station control and monitor console to meet DSN operations requirements for operation of the DSS on a system basis, by system engineers. The operations control specification will be used by DSN development personnel for incorporation into future design.

This represents a significant change in operational philosophy. It should improve station reliability and reduce response time and operating costs, by allowing the station to be operated by a smaller number of more highly qualified personnel on each crew.

## II. Implementation

Based on information obtained from station personnel and from cognizant operations engineers, a simulated control console has been assembled and installed at DSS 12. This is shown in Fig. 1. This console is intended to serve as a test bed for further investigations. The console was assembled primarily from spare assemblies and existing surplus hardware, at very low cost, and is definitely not an optimum configuration.

The following criteria governed the development of the simulated console:

- (1) No function that required high cost or considerable engineering design would be included
- (2) No function that is mission dependent would be included
- (3) Only those functions that are necessary for station operations from the completion of countdown through the tracking and post-calibration period would be included
- (4) Only those functions that are regularly used during tracking would be included
- (5) Within space limitations, all functions would be located for easy access by the operator in a seated position
- (6) Functions would be grouped to aid in the reduction of human errors
- (7) A local/remote operations switch would be included, to allow operation from either the console or the normal operating position

The basic functions required to implement these criteria are grouped in six areas as listed below and as shown in Fig. 2.

- (1) Antenna positioning
- (2) Spacecraft communications

- (3) Data communications
- (4) System monitoring
- (5) Analog instrumentation, recording, and TTY
- (6) Voice communications

## III. Current Activities

The console is operational at DSS 12. It has been the normal control point for DSS 12 operations since mid-January, although "local" control of some subsystems has been used on occasion.

A number of changes in the console have been suggested as a result of the operational experience to date. Some of these have been incorporated, and others will be as soon as feasible. Some desirable changes cannot readily be included in the present console.

A major side benefit of the DSS 12 installation has been the reduction of personnel required in the control room during normal Pioneer cruise mode operations. Ordinarily only one person is required to control the station between acquisition and end of track. This allows intensive training of other station personnel to be conducted at the same time.

## IV. Future Activities

During the next few months, continued operation of the console is anticipated. This will release most station personnel for training in operation of the station on a system basis, coinciding with an increase in staffing required for three-shift operation later in the year. Effects of long-term operation using the console will be observed. An analysis of procedures will be made, to determine changes which may be desirable for more efficient operation under the system philosophy. The analysis of station operations functions will be continued, to determine which functions should be remoted and which are amenable to automation. The results of these analyses will be included in the operations control specification.

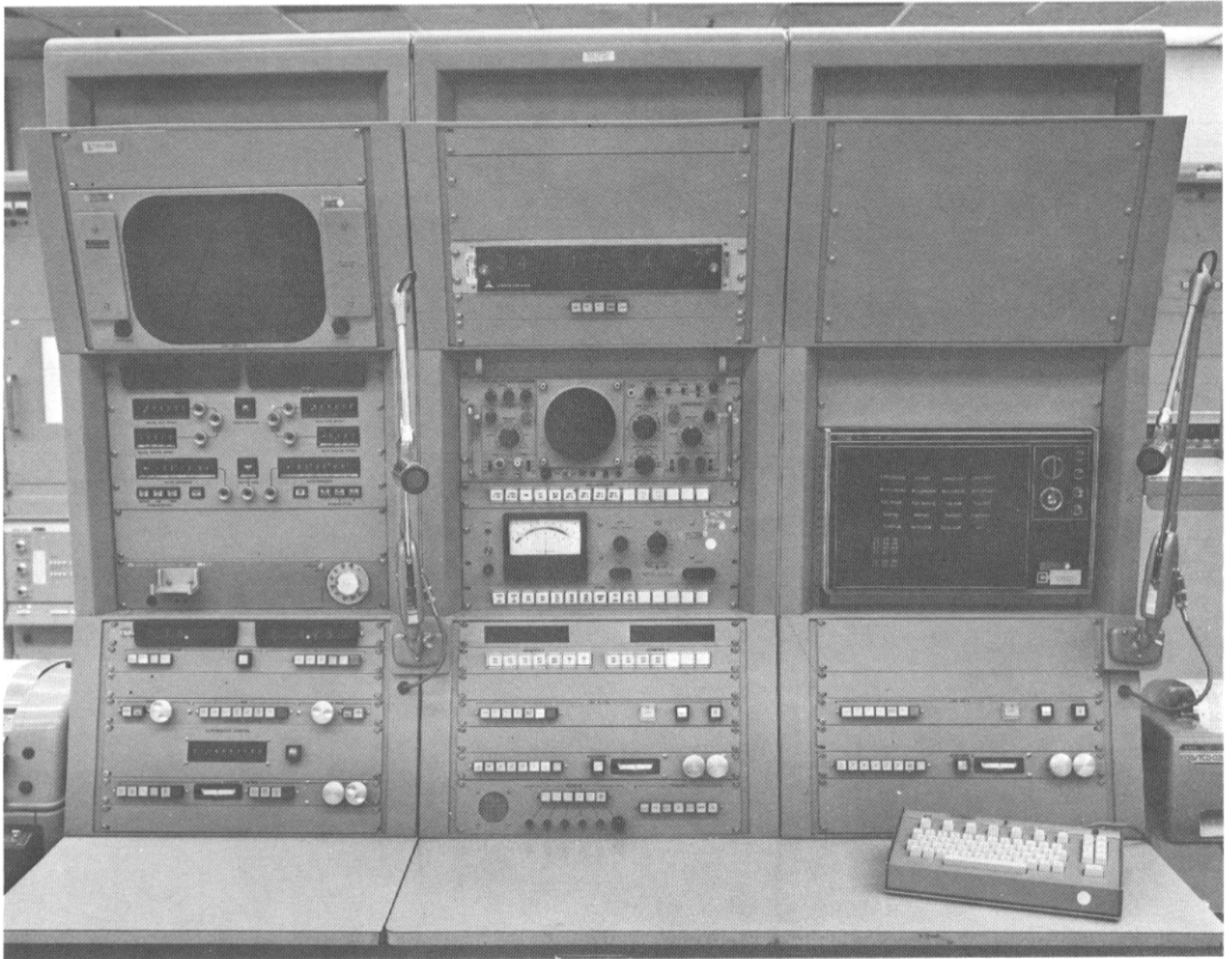
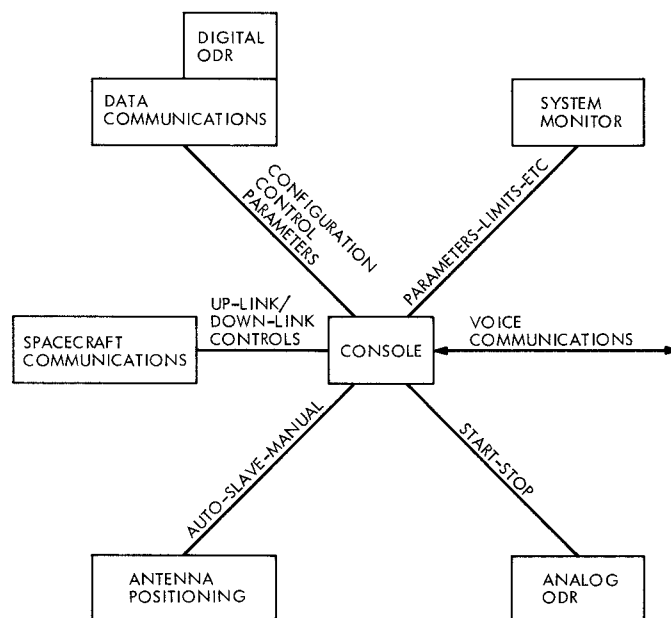


Fig. 1. Simulated DSS control console



**Fig. 2. Station monitor and control function**